United States
Department of
Agriculture

Cooperative State
Research Service

September 1986

Animal Health Science Research Advisory Board

1985 Annual Report

ANIMAL HEALTH SCIENCE RESEARCH ADVISORY BOARD

1985 ANNUAL REPORT

Cooperative State Research Service
United States Department of Agriculture

ANIMAL HEALTH SCIENCE RESEARCH ADVISORY BOARD

Dr. Orville G. Bentley (Chairman)
Science and Education
217W Administration Bldg.
U. S. Department of Agriculture
Washington, DC 20250

Mr. Bert Hawkins (Vice Chairman)
Animal & Plant Health Inspection Service
313E Administration Bldg.
U. S. Department of Agriculture
Washington, DC 20250

Dr. Dyarl D. King (Executive Secretary)
Cooperative State Research Service
217 J. S. Morrill Bldg.
U. S. Department of Agriculture
Washington, DC 20251

Dr. Travis C. McGuire
College of Veterinary Medicine
Washington State University
Pullman, Washington 99164

Dr. H. Graham Purchase
Agricultural Research Service
Room 227, Building 003, BARC-West
Beltsville, Maryland 20705

Dr. Richard H. Teske
Center for Veterinary Medicine
5600 Fishers Lane
Food and Drug Administration
Rockville, Maryland 20857

Mr. J. Robert Kindig
Route 1, Box 112
Conestoga, Pennsylvania 17516

Dr. David L. Meeker
Natural Pork Producers Council
P.O. Box 10383
Des Moines, Iowa 50306

Dr. William J. Benton
Agricultural Experiment Station
University of Delaware
Newark, Delaware 19711

Dr. Robert E. Bohlender
Route 2, Box 253
North Platte, Nebraska 69101

Dr. Irvin T. Omtvedt
Agricultural Experiment Station
University of Nebraska
Lincoln, Nebraska 68583

Dr. John T. Neilson
1722 N.W. 49th Terrace
Gainesville, Florida 32605

EXECUTIVE SUMMARY

The New Animal Health Science Research Advisory Board was established by Public Law 95-113, the Food and Agriculture Act of 1977, to advise the Secretary on the implementation and priorities of animal health research authorized by the Act. This includes two new programs, authorizing extramural, Federal support for animal health research — Section 1433, the Animal Health and Disease Formula Research Program, and Section 1414 ooo(c)(1), Special Research Grants for animal health. Both programs are administered by the Cooperative State Research Service and have received appropriations over 8 consecutive years (Fiscal Years 1979-1986). The Animal Health Science Research Advisory Board has provided consultation and advice essential to the implementation of these programs.

New research under these programs was initiated in Colleges and Schools of Veterinary Medicine, State Agricultural Experiment Stations, and in other cooperating institutions. Currently, research projects aimed at providing solutions to food animal health problems are being conducted under the Section 1433 Program. Under the Special Research Grant Program, 529 projects have been selected competitively for funding from 3,384 proposals submitted by scientists over an 8 year period. Many of these funded projects are still in progress.

This report summarizes (1) the current status of animal health research programs under Section 1433 and Special Research Grants, (2) 1985 recommendations and actions of the Animal Health Science Research Advisory Board, and (3) specific examples of progress made in research under these new programs.

CONTENTS

ANIMAL HEALTH SCIENCE RESEARCH ADVISORY BOARD

1985 ANNUAL REPORT

I. Current Concerns in Animal Health

Losses from food animal diseases are estimated at $15 billion a year. This touches every person in this nation, rich or poor, since it adds to the first-dollar-cost of food.

Because today we have surpluses, some policymakers may feel that we do not need to address these problems. One can debate how long surpluses will be the order of the day, but the major issue is the unnecessary billions of dollars lost each year because of inadequate technology to correct known problems in animal health.

This country has done a miraculous job in advancing capabilities in human disease prevention, control, and treatment. Terrifying disease scourges of the past have been eradicated or fully controlled, life can be prolonged by organ transplants, and serious crippling conditions can be corrected. Life is made more pleasant by these great biomedical advances. Ironically, many of the biomedical breakthroughs were made by veterinary scientists working in biomedicine. For example, the artificial heart of international acclaim was perfected to a great extent by a veterinarian. These contributions indicate that very significant advances are possible in animal health—their development depending in large part on the level of resources committed.

The Food and Agriculture Act of 1977 (PL 95-113) recognized significant research opportunities to increase livestock production efficiency and food safety through emphasis on solving animal health problems.

Two new extramural programs were initiated which provide USDA support for animal health and disease research under authorizations of PL 95-113. These are the Animal Health and Disease Research (Section 1433) Formula Program and the Animal Health Special Research Grant Program, (Section 1414(c)(1) amending Public Law 89-106). Provisions of these authorizations for animal health research were further strengthened under amendments included in Public Law 97-98, the Agriculture and Food Act of 1981, and Public Law 99-198, the Food Security Act of 1985. The U. S. Department of Agriculture Appropriation Act for Fiscal Years 1979-1986 has provided funds to carry out animal health research provisions of Public Law 95-113 and Public Law 99-198 at levels indicated in Table 1.

Table 1

Item	FY 1979	FY 1980	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985	FY 1986
Formula Funds (Sec. 1433)	5,000	6,000	6,500	5,760	5,760	5,760	5,760	5,476
Spec. Research Grants Animal Health	10,000	7,000	5,050	7,156	7,156	7,156	6,000	5,705
Minor Use Animal Drugs	—	—	—	240	240	240	240	229
Total	15,000	13,000	11,550	13,156	13,156	13,156	12,000	11,410

The Animal Health Science Research Advisory Board was established in response to the mandate of Section 1432, Public Law 95-113. In accordance with the provisions of this authorization, the Board represents national livestock commodity organizations, State Agricultural Experiment Stations, Colleges and Schools of Veterinary Medicine, and specific Federal agencies responsible for food animal health research and regulatory programs.

II. Status of Programs

1. Section 1433, Animal Health and Disease Formula Program

Program Objectives

The Animal Health and Disease Formula Program (Section 1433) is directed toward improving the health and productivity of animals and the welfare of producers and consumers of animal products; protecting human health through control of animal disease transmissible to humans; minimizing livestock and poultry losses due to transportation and handling; facilitating the effective treatment and prevention of food animals and horse diseases, protecting livestock and poultry from diseases of wildlife; and providing improved methods of controlling birth of predators and other animals.

Approach

Under the Section 1433 formula program, the USDA has been able to strengthen its animal health research partnership with the State Agricultural Experiment Stations and to extend this partnership to all Colleges and Schools of Veterinary Medicine. Provisions of Sections 1433 are unique in that funds are distributed to the States in relation to State's livestock importance and its capacity to conduct animal health and disease research. When more than one eligible institution exists within a State, The State's entitlement is distributed to these institutions in accordance with their animal health research capacities. State contributions to expand animal health research are encouraged through a requirement that each State match any Section 1433 funds received annually in excess of $100,000.

Formula Provisions

Section 1433 provides for support of livestock and poultry disease research in Colleges of Veterinary Medicine and in eligible State Agricultural Experiment Stations. These funds are distributed as follows:

48 percent are distributed in an amount proportionate to the value of and income to producers from domestic livestock and poultry in each State to total value of and income to producers from domestic livestock and poultry in all States.

Livestock Value (USDA-Data)	24%
Livestock Income (USDA-Data)	24%

48 percent are distributed in an amount proportionate to the animal health research capacity of the eligible institutions in each State to the total total animal health capacity in all the States.

Expenditures for Animal Health Research (Eligible Institution Data)	24%
Scientist Years for Animal Health Research (Eligible Institution Data)	24%

Four percent is retained by the Department of Agriculture for administration, program assistance to the eligible institutions, and program coordination.

In a State with two or more eligible institutions, that State's allocation is distributed in the proportion that the animal health research capacities of these institutions bear to the total capacity of the State.

Eligible institutions must provide non-Federal matching funds in States receiving annual amounts in excess of $100,000 under this authorization.

Current Activities (Funding FY 1985 - $5.76 million, FY 1984 - $5.76 million)

Fiscal Year 1985 is the seventh year in which the Section 1433 program was active. Institutions receiving FY 1985 funds include 40 State Agricultural Experiment Stations and 16 Colleges of Veterinary Medicine qualifying individually and 11 such stations and 11 colleges qualifying as combined institutions.

Recommendations of the Animal Health Science Advisory Board are being followed in program administration by CSRS (i.e., scope and priorities of eligible research, determination of research capacity of eligible institutions, and other questions on program administration). In accordance with advice of the Board, emphasis in this research centers on the solution of high-priority diseases or other health hazards in the production of livestock, poultry, and aquaculture species.

Research is in progress on more than 470 projects seeking solutions to infectious diseases or parasitic problems of food animals and horses. Strong emphasis is being placed on solution to respiratory, enteric, and reproductive diseases. Other major problems such as mastitis, brucellosis, pinkeye, internal parasites, and toxicoses are being investigated. New or improved methods are being developed to control these diseases and other high priority problems such as bovine leukemia, salmonellosis, bluetongue, and TGE. New biotechnology procedures including genetic engineering, monoclonal antibody, virus fingerprinting, and subunit immunization are being employed to accelerate needed breakthroughs.

Data was provided to the Board showing the fluctuations that have occurred from year to year in the amount of Section 1433 funds that individual institutions have received. Changes in animal health research capacity appear to be a significant factor in yearly variations in the amounts that institutions receive (other than variation in the total amount of funds available for the program). Tables 2 and 3 provide these data. Proposals of new legislation for an animal health research formula program may need to consider the possibility of a minimum funding base for each institution.

2. Section 1414(c)(1), Special Research Grants in Animal Health

Animal health research under the Special Research Grant Program has placed emphasis on the solution of problems of highest priority and national importance. Grants of up to $150,000 currently are made for funded projects—permit-

and productive animal health scientists. Projects are funded with a single grant and expenditures are permitted over a period of up to 5 years depending upon budgets and work plans as presented in the proposal. This Program is administered by the Cooperative State Research Service. Eligible diseases and their priorities are identified annually by the Animal Health Science Research Advisory Board through recommendations from national livestock and poultry commodity organizations and other groups concerned with animal health. A competitive process with peer panel evaluation of proposals has been used in the placement of the majority of grants made under this Program. Peer panel members are selected from a Technical Advisory Committee appointed by the Secretary.

During the seven years of competition in Animal Health Special Research Grants (1979-1985), there has been a total submission of 3,047 proposals requesting over $394 million; 478 proposals have received awards totaling $47,579,249. Table 4 provides a summary of the awards made by commodity and diseases. Data for 1979 include $505,756 of Special Research Grant funds awarded noncompetitively to 17 State Agricultural Experiment Stations as Supplementary Research Grants.

Current Activities

Fiscal Year 1985 competitive program in animal health research was based on research priorities established by the Board at the September 12, 1984 meeting. A Federal Register announcement used these priorities. As recommended by the Board, investigators with previous awards were requested to submit summaries of accomplishments and publication lists. Not all investigators followed these instructions.

3. Report from the Council on Research, AVMA

D. K. Sorensen reported for the Council, and as agreed at last year's meeting of the Board, provided a list of recommended priorities by various commodity groups. A compilation of these priorities was made and is included in Table 7.

4. Report from the Competitive Research Grant Office

W. D. Carlson and K. J. Cremer reported on activities in CRGO involving the competitive programs in Animal Science and Biotechnology. A total of 890 research proposals were considered in Biotechnology; 324 were animal oriented with more than one-half having animal health implications. A total of 191 proposals were reviewed in the Animal Science program of which 15 were centered on Brucellosis. Success rates based on proposal numbers were about 19 or 20 percent for the areas of animal competition. Success rates based on funds awarded versus funds requested were about seven or eight percent. Funds were available for only about one-half of the proposals that the panels felt should receive awards. Individual proposal awards averaged from $120,000 to $140,000 for 2-year projects. There was close coordination with CSRS staff to avoid duplicate funding of projects which also competed in the Animal Health Special Research Grant Program.

5. Minor Use Animal Drugs

R. H. Teske reported on the activities of the Center for Veterinary Medicine, FDA, in strengthening the Minor Use Animal Drug Clearance Program. The Center is committing about $800,000 to this program in FY 1985. Funds have been made

available for studies of comparative metabolism in ruminants that will facilitate the extrapolation of drug metabolism data from cattle to sheep and other minor species. Other studies are being supported that will facilitate clearance of drugs for use in other minor species including aquaculture. Approximately $200,000 in grants or cooperative agreements will be placed very soon for studies of minor use drugs in aquaculture. In addition to these funding activities, the Center for Veterinary Medicine continues to provide a professional staff member to assist in minor use drug clearance work at the IR-4 headquarters at Rutgers University. Also, the Center is sponsoring another symposium on minor use animal drugs to facilitate coordination and planning by the various participants involved in this program. Six drugs have now received approval for use in minor species since the program began.

6. Study of the Minor Use Pesticide/Animal Drug Program (IR-4)

K. Dorschner and R. H. Kupelian discussed the organization and activities of IR-4 and the evaluation study of the program that is just being initiated. The last intensive review of the program was made in 1976 prior to inclusion of minor use animal drugs. The study will include an assessment of factors such as program objectives, impediments and aids to progress, coordination among leader laboratories and headquarters staff, and the adequacy of funding levels and funding mechanisms. The review has been completed. CSRS administrators, IR-4 administrators and the technical committee are developing a plan of action based on the review report. The Board was complimented on its foresight in providing funds to initiate the minor use animal drug clearance program. Three drugs now have been cleared by the FDA from the initial funds made available for this purpose by the Board. The Animal Plant Health Inspection Service has made some funds available for initiating a program to aid in clearing biologics for minor species of animals.

7. National Academy of Sciences Study of CSRS Animal Health Research Programs

P. Ross described the membership of the study committee, the purposes of the study and the progress made to date. The study was initiated at the request of the Board. Consultations have been held by the study committee with representatives of the State Agricultural Experiment Stations, Colleges and Schools of Veterinary Medicine, USDA agencies concerned with animal health, national livestock commodity organizations, Congressional aides and others. The report being developed by the Committee was reviewed intensively by the Academy before release. The report was releaed in July, 1986.

III. 1985 Recommendations of the Animal Health Science Research Advisory Board

In this year's competition, 446 proposals requesting more than $54 million were evaluated in 6 panels. This number of proposals compares to 417 evaluated last year. Table 5 summarizes the success rates and funds awarded in the areas of eligibility.

The Board recommended that the Federal Register announcement of the program for 1986 more clearly identify the requirements for investigators with previous awards.

At the 1984 meeting the Board considered a request to include rabbit diseases as an eligibility area of research. At the 1985 meeting, the Board agreed to consider the possibility of a category for diseases of minor animal species.

The Board recommended that in view of the limited funds and urgent problems in major livestock species, a special category earmarking funds for diseases of minor animal species should not be established at this time.

A letter from the National Wool Growers Association was reviewed by the Board concerning the need to place awards on the highest priority sheep problems.

The Board discussed the need for peer panels to consider other factors such as the scientific quality of the proposed research and qualifications of the investigator(s) in addition to disease priority. The Board recognized, however, that there have been too many eligible sheep and goat diseases listed under the Animal Health Special Research Grant guidelines. The Board recommended that the eligible diseases in this category be limited to bluetongue, foot rot, chlamydial polyarthritis, respiratory disease, and mastitis.

The Board reviewed animal health priority lists that were submitted for its consideration by the principal national livestock commodity and veterinary medical organizations. The Board then developed quidelines for animal health research that should be followed under the CSRS Animal Health Special Research Grant Program. This included the specific livestock diseases that should be made eligible for research under the program and the percent of funds that should be allocated to each disease.

The Board recommended that some funds again should be earmarked specifically for Johne's Disease; that colibacillosis should be added to the list of swine enteric diseases and pseudorabies be included only under Other Swine Diseases; that Poultry Respiratory Diseases and Poultry Metabolic and Immunologic Diseases receive equal levels of funding; and that eligible sheep and goat diseases be limited to bluetongue, foot rot, chlamydial polyarthritis, respiratory diseases and mastitis. Table 6 summarizes the board's priority recommendations.

Long Term Animal Health Research Program Issues

J. P. Jordan discussed the problem of uncertain base funding for animal health in the current Section 1433 Program. The Board was asked for suggestions on ways this situation might be corrected.

The Board agreed that it very strongly supports the concept of a balanced program of formula and competitive animal health research and that implementation of this concept should be investigated through new legislation.

Next Annual Meeting

The Board discussed the desirability of learning more about the animal health research activities of the Agricultural Research Service, USDA, and the regulatory activities/research needs of the Animal Plant Health Inspection Service, USDA.

IV. Selected Examples of Progress in Animal Health Research

Some examples of progress were selected from reports submitted by investigators of projects that received support from Section 1433 (Formula) and Section 1414(c)(1) (Animal Health Special Research Grant) funding. The research work on many of these projects has not been completed. Examples were selected from animal health and disease research projects involving cattle, swine, poultry, sheep, goats, and aquaculture.

Index

General

Assurance of Safety for in vitro Fertilization of Embryos

Questions have been raised whether genetic abnormalities might be incurred during the process of laboratory fertilization of embryos, a process that is increasing in frequency in animals and people. Michigan scientists have completed the first and only study thus far to assess the possibility of chromosomal damage during in vitro fertilization on nonhuman primate embryos. It was found that chromosomal abnormalities occurred at the same rate as that found in naturally fertilized embryos. Thus there is no evidence to suggest a higher incidence of birth defects in embryos produced by in vitro fertilization. This finding has immediate application to the increasing research and commercial interest in this process in livestock and to the use of the process in people.

Improved Test for Detecting Mycotoxins

Intensive studies by Missouri scientists have resulted in the development of a rapid, inexpensive analytical method for the detection of eight different fungal toxins which are harmful to animals and people. These are the most common mycotoxins found in grains and mixed feeds. The test permits the monitoring of large numbers of samples at minimal cost to livestock producers. Using this new procedure, the Missouri scientists in cooperation with State and Federal agencies, have been able to rapidly assess the severity of mycotoxin contamination in Missouri crops. This information has permitted early advice to be given livestock owners and veterinarians when potential hazards existed and provided regulatory agencies with data needed to allow grains to be moved interstate.

Cattle

Respiratory Diseases

Cause and Prevention of Pulmonary Emphysema in Cattle

Intensive studies by Washington scientists have established the cause and developed effective preventive strategies for pulmonary emphysema, a disease that affects cattle worldwide. This perplexing disease has been found to be caused by a toxin in lung tissue which forms following absorption of 3-methylindole (3MI), a product of digestion. The disease can be prevented by glutathione, a cellular constituent that can detoxify the lung toxin and protect against 3MI-induced injury. These findings not only have contributed to the prevention of pulmonary emphysema in cattle, but they also have important implications to the understanding of lung injury in other animals and people. The Washington scientists have found that other animal species including primates develop this lung toxin on exposure to 3MI. It is postulated that the disease could occur in people through intestinal absorption of 3MI from certain foods and in lung absorption from cigarette smoke.

Prevention of Bovine Respiratory Disease

Respiratory disease in cattle causes annual losses exceeding $500 million, making this the disease problem of greatest concern in the production of beef. Although numerous disease agents may be involved in causing the disease, the bacterium Pasteurella haemolytica is one of the agents most frequently associated with the disease. Oklahoma scientists have found evidence that P. haemo-

lytica produces respiratory disease by means of a toxin, and that resistant animals have protective antibodies against the toxin in their blood stream. Following these clues, the Oklahoma scientists have produced a vaccine that produces toxin neutralizing antibodies in calves. The resulting level of resistance to respiratory disease is directly correlated with the amount of toxin neutralizing produced by the vaccine. These findings help clarify the mechanism by which bovine respiratory disease occurs and provide the basis for the eventual production of more effective vaccines.

Parasitic Diseases

Progress in the Search for a Vaccine for Anaplasmosis

Washington scientists, using biotechnology procedures, have identified and isolated a membrane protein from the causative agent of anaplasmosis that induces an immune response in cattle. They have found that the protein is present in all isolates of the disease agent tested thus far in the US, thus suggesting that a subunit vaccine developed from this protein has promise of controlling the disease throughout the country. Their research now is centered on constructing the vaccine by genetic engineering techniques. Anaplasmosis causes the death of over 100,000 cattle a year in this country at an annual loss estimated to exceed $100 million. There is urgent need for more effective methods to control the disease. Advances in biotechnology research, such as is being made in this study, offer excellent prospects for improved prevention and control.

Tissue Culture Vaccine for Bovine Anaplasmosis

Results of the investigation showed that the degree of protection conferred by non-replicating culture-derived immunogens is dependent upon the degree of homology between vaccine and field strains. In cross-challenge studies, in vivo with two morphologically distinct bovine anaplasmosis isolates (Florida and Illinois isolates), neither isolate was immunodominant over the Illinois isolate. The high-molecular-weight parasitic antigens of the 2 isolates were noticeably different, although the low-molecular-weight antigens were similar. These findings indicate that antigenically distinct anaplasmosis strains exist in the United States which can induce disease in animals that have recovered from infections caused by other strains.

Tick Research to Aid in Control of Anaplasmosis

Researchers at Oklahoma State University have identified the causative agent of bovine anaplasmosis, Anaplasma marginale, in ticks and have documented its complex developmental sequence from the infection of nymphs through transmission of the organism to susceptible calves. Identification of the tick stages has provided new approaches for control of the disease. Inhibition of the tick transmitted stage would prevent infection in cattle. Research is underway to characterize this transmitted stage.

Mastitis

Protective Role of Vitamin A and B-carotene Against Mastitis

Dairymen rely heavily on antibiotics for controlling mastitis, but antibiotics usage is a public health concern. The laboratory took a nonantibiotic approach

to increase the animal's own natural defense through proper vitamin A and vitamin B-carotene (a vitamin A precursor) nutrition. Vitamin A is important in maintaining epithelial health and proper immune function. Through a series of studies using cows and mice, the protective role played by vitamin A and B-carotene against mastitis was demonstrated. Recently, two experiments were completed in which dairy cows were fed (1) 53,000 IU vitamin A (represent 100% of NRC recommended level), (2) 173,000 IU vitamin A, or (3) 53,000 IU vitamin A plus 300 mg B-carotene/head/day.

Cows fed vitamin A and B-carotene showed the lowest incidence of new intramammary infections during the early dry period as compared those fed vitamin A alone. These findings have practical implications to the Dairy Industry in reducing the incidence of mastitis, as these nutrients can easily be incorporated into animal feed.

Metabolic Diseases

Cause and Prevention of Fat Cow Syndrome

A disease has been known for some years which causes dairy cows to become excessively fat during late pregnancy with greatly increased risk of death. It has been assumed that this condition is due to obesity, and based on this assumption, prevention has centered on the use of poor quality, low energy diets to control weight gains. Michigan scientists now have found that the disease is associated with a sudden infiltration of fat into liver cells caused by a rapid loss of weight during late pregnancy. The earlier assumption of prevention by low energy diets has been shown to be completely wrong and the disease can now be avoided by diets containing proper levels of energy in mid and late gestation. In related studies, California scientists have developed a test that can detect early cases of liver abnormality due to the "fat cow syndrome". This test will be useful in warning of possible ill-effects in pregnant cows on marginal diets.

Prevention of Milk Fever in Dairy Cows

Scientists in the College of Veterinary Medicine at the Ohio State University have discovered an effective way to prevent the development of parturient hypocalcemia ("milk fever") in dairy cows by the administration of a difluorinated active metabolite of vitamin D(24,24-F2-1-a,25-(OH)2 cholecalciferol) immediately prior to parturition. The 24,24-F2-1-a,25-(OH)2 cholecalciferol has been shown to be more effective than other vitamin D metabolites in stabilizing the blood calcium, phosphorus, and magnesium concentrations of pregnant cows.

Reproductive Diseases

New Method to Detect Estrus in Cattle

Research at Texas A&M University has disclosed the feasibility of developing a more effective way to detect estrus in cattle. A mechanism by which bulls detect estrus has been demonstrated and that information makes it feasible to attempt development of a chemical field test for estrus in situations where bulls are not present (situations where artificial insemination is used).

In these studies it was found that bulls are sexually excited by an as-yet-unidentified chemical (pheromone) that is given off during estrus in the mucus

secretions of the female reproductive tract. This sexual excitement of bulls can be produced by presenting the estrus mucus in a dish under conditions when no females or other sources of sexual stimulation are present. The pheromone excites bulls by a combination of stimuli involving smell, taste, and vomero-nasal organ function. The pheromone is present in mucus that has not been contaminated by urine. Moreover, several different ways to extract and partially purify the pheromone without altering its behavioral effects have been developed.

Other Diseases

New Test and Vaccine for Vesicular Stomatitis in Cattle

Using biotechnology research techniques, Washington scientists have developed a new diagnostic test and a vaccine for vesicular stomatitis which are superior to previous biologics used in controlling this disease. Vesicular stomatitis is a highly contagious viral disease of livestock which causes lowered milk production, weight loss and death in cattle. This disease is of great concern to livestock disease control officials since its symptoms and rapid spread are often identical to foot and mouth disease. Time consuming tests have been required to be certain that vesicular stomatitis outbreaks are not foot and mouth disease. The new vaccine provides an immunity of much longer duration than previous vaccines, and permits differentiation of vaccinated animals from those naturally infected. The new diagnostic test permits identification of vesicular stomatitis outbreaks under field conditions in less than six hours. This will be of great assistance to livestock disease regulatory officials in assuring almost immediate differentiation of vesicular stomatitis from foot and mouth disease.

Interactions of Interferon on Appetite in Clinical Disease

Bovine respiratory disease is the most important infectious disease of beef cattle and results in clinical illness, reduced feed intake, loss of expected weight gain and sometimes death. Scientists at the Texas Agricultural Experiment Station have found that cattle treated orally with the antiviral substance interferon had altered feed efficiency and appetite. Depending on the dosage of interferon, feed efficiency and appetite could be increased. Interferon injected directly into the rumen, nasal cavity, bloodstream or muscles did not affect appetite or feed efficiency. This suggests that an interferon receptor exists in the mouth or pharynx. These findings may be of significant benefit to the cattle industry if a method of favorably modulating appetite and feed efficiency can be developed. The exact site of activity is under study. Based on these and other studies, interferon is presently commercially available to cattlemen in Texas.

Swine

Diagnosis of Mycoplasmal Pneumonia

Electrophoretic immunoblotting was employed to separate and identify immunogens from *Mycoplasma hyopneumoniae.* Immunogens of approximately 36, 41, 50, 64 and 110 kilodaltons molecular weight were identified with serum from swine convalescent from mycoplasmal pneumonia. One of the immunogens was found to cross react with *Mycoplasma hyorhinis* while three cross reacted with *Mycoplasma flocculare.* Three of the immunogens were tryspin-sensitive, whereas two resisted the action

of trypsin. The results indicate that only one of five specific immunogens inducing antibodies in swine infected with M. hyopneumoniae may yield specific serologic results. Attempts are underway to isolate the specific immunogen and to evaluate its potential for use in serodiagnosis of mycoplasmal pneumonia of swine.

The Failure of Mycobacterial-like Lesions as a Diagnostic Test

The USDA Meat and Poultry Inspection Service considers that "mycobacterial-like" lesions in the cervical and mesenteric lymph nodes of swine carcasses are pathognomonic for swine tuberculosis which is considered to be a threat to the health of human beings. In order to evaluate the lesions criteria as a diagnostic test, attempts were made to isolate mycobacteria from carcasses with and without lesions attributable to a tubercular infection. Mycobacteria were isolated from 68% (41/60) of the carcasses with lesions and 65% (39/60) of the carcasses without lesions. Sensitivity and specificity of the lesion as a diagnostic test were 51.3% and 52.5%, respectively. This test is maximally flawed in that it cannot detect mycobacterial infection better than chance alone ($X^2 = 0.15$). Therefore, the test does not shield the consuming public from contact with pork infected/contaminated with mycobacterial organisms. This statement probably applies to beef and poultry also since these products are inspected only visually for mycobacterial infection. The need to reevaluate the policy and its implementation is patent.

Anticholinergic Agent Beneficial in the Treatment of Secretory Diarrhea

Previous studies have indicated that anticholinergic and opiate agents may block the intestinal secretory effects of certain bacterial toxins implicated in diarrheal disease. Scientists in the School of Veterinary Medicine, North Carolina State University examined the effect of an opiate derivative, loperamide, on both small and large intestine absorption in the absence of a bacterial toxin which produces secretory diarrhea in the pig. Under control conditions, loperamide stimulated net absorption from both small and large intestines and partially reversed the effect of the bacterial toxins. Although the agent appears to stimulate a parallel absorptive pathway rather than directly blocking secretion, its use may be beneficial in the pharmacologic treatment of secretory diarrhea in the pig.

Intestinal P-Cresol Production by Gnotobiotic Pigs

Monoassociation of germ-free baby pigs (gnotobiotic) with a p-cresol producing bacterium isolated from pig feces, and feeding the precursor of this toxic metabolite in the pig diet results in death of the animal. This demonstrates that a toxic response due to in situ production of p-cresol is possible, and supports our hypothesis that the metabolite may be responsible for a growth depressing effect in young animals. The pathological lesions produced by this technique can provide information on the metabolic site where the problem occurs in the animal. A better understanding of this acute toxic response due to p-cresol may explain why dietary antibiotics stimulate the growth of young animals, and possibly suggest alternative methods of alleviating the problem.

Poultry

Vaccine For the Control of Poultry Respiratory Disease

Respiratory disease due to Mycoplasma gallisepticum has been largely eradicated from U. S. poultry. However, because of large, multiple-age farms, Mycoplasma gallisepticum is a major problem in commercial egg production. Infection with this organism may cause a loss in egg production of up to 20 eggs per hen and an annual financial loss exceeding $97 million. A live vaccine and a killed bacterin developed by Georgia scientists have been shown to give excellent protection against egg production losses and virtually eliminate medication costs in infected flocks. Additionally, both types of vaccines significantly reduce the level of egg transmission to progeny chicks. The live vaccine also provides excellent protection against natural infection and may be a useful tool in eradication programs.

Flock Health Surveillance System

Modern day health management practices have minimized clinical disease in broilers on a day to day basis, but subclinical (inapparent) disease may still be present. The differential in production cost between the least efficient and most efficient grower is small and the control of subclinical disease can be a crucial determinant of success or failure. To assist in detecting and eliminating subclinical infections, Mississippi scientists have developed a system of surveillance of broiler health for Mississippi poultry producers. This system permits the identification of disease problems and provides remedial measures during the broiler grow out period. Since the implementation of this computerized system three years ago, there has been a marked decline in broiler condemnations in Mississippi.

An Automated System for Testing Disease Resistance in Poultry

An automated system for monitoring the level of antibodies that protect against the major respiratory diseases of poultry has been developed by Pennsylvania scientists. The system can quickly and accurately perform large numbers of tests at low cost, and therefore, is ideally suited for monitoring the status of disease resistance in large, commercial poultry flocks. The recent devastating outbreak of avian influenza demonstrates the need for rapid, reliable techniques to assess the disease and immunity status of poultry flocks. The system developed by these scientists uses a highly sensitive and accurate test (ELISA) combined with computer-operated equipment to identify and quantify circulating antibodies in poultry. It is anticipated that this new system will find immediate application in assisting to reduce an annual loss of more than $370 million due to poultry respiratory diseases.

Musculoskeletal Disease of Poultry

Lameness in broilers is a major contributor to trims in the processing plant. Lesions of the proximal femur especially those associated with the femoral head necrosis complex are frequently implicated in lameness with an estimated cost of $6.5 million to the poultry industry in Georgia alone. Often these lesions have been attributed to infectious organisms or nutritional problems which have prompted recommendation of use of antibiotics or vitamin supplements in feed. These procedures increase the cost of the product to the consumer. Researchers at the University of Georgia College of Veterinary Medicine have evaluated a

large number of broilers with femoral head necrosis complex and have attempted to associate the lesions with infectious or nutritional problems existing in the production unit. The results of this research indicate that femoral head necrosis is frequently an artifact appearing during postmortem examination and is not an antemortem lesion. Placing this artifact in proper perspective will enable improved cost-effectiveness in prevention and control of poultry diseases.

Sheep and Goats

New Vaccine for Control of Foot Rot in Sheep

Foot infection caused by a bacteria, Bacteroides nodosus, is the major disease affecting sheep in the western states and is a continuing problem in other areas of the country. The cost of foot rot outbreaks in western range flocks has been estimated to cost as much as $18 per ewe per year. Colorado scientists have completed the evaluation of a new vaccine in 500 ewes. The results clearly indicate that the severity of the disease was decreased in vaccinated animals, while in the controls the disease became worse during the test period. These results indicate that vaccination is a management tool that will help producers in their efforts to control and possibly eradicate foot rot due to B. nodosus. Studies are continuing to determine if there may be different serotypes of the causative organism for which the vaccine may be less effective.

New Parasitic Disease of Sheep Identified

Oregon scientists have found sheep in that state infected with the parasite known as Nematodirus battus. This is the first report of that parasite in the United States and the Western Hemisphere. The significance of this finding is that in Britain, where the parasite has been known to occur, it is considered the most pathogenic internal parasite of those affecting young lambs. Mortality in some flocks can range up to 75 percent. Studies are being made by the Oregon scientists to further determine the extent of the parasite infection in local areas and to assess the potential for losses of sheep. Early detection of foreign pathogens, such as this parasite, is extremely important in protecting our livestock from devastating foreign disease agents.

Photosensitive Disease of Sheep

At Texas A&M University, an investigation of the photosensitive disease of sheep grazing on pastures consisting of pure strands of Kleingrass (Panicum coloratum) has revealed that lesions of the livers of affected sheep are identical to those of sheep poisoned by lechuguilla (Agave lechuguilla), sacahuiste (Nolina texana) and goat head (Tribulus terrestris). Poisoning by lechuguilla and sacahuiste are known to be caused by saponins. Although these latter plants are of some significance to the sheep industry, Kleingrass has become the most important forage grass for sheep in Texas, there being more than 700,000 acres of pasture seeded to this plant in 1984. On some ranches, the occurrence of photosensitization in Kleingrass pastures has been so severe and has been repeated so frequently that the grass has been abandoned as forage. Preliminary results strongly suggest that a saponin or saponins are responsible for the toxicity of this plant. Further clarification of this will allow the application of modern plant genetics to develop less toxic or nontoxic strains of Kleingrass for future use.

Improved Immunodiagnosis for Ovine Fascioliasis

Researchers at the College of Veterinary Medicine at Oregon State University have developed the DOT-ELISA for *Fasciola hepatica* infections in sheep. The assay will detect serum antibodies to *F. hepatica* as early as 2-4 weeks post-infection. This is a significant improvement over diagnosis by the ELISA (diagnosis 6-8 weeks post infection) or fecal examinations (diagnosis 8-16 weeks post-infection). This new DOT-ELISA provides early diagnosis so that proper anthelminthic treatment can be initiated prior to the appearance of severe pathological changes that occur later in infected sheep. Prevention of the damage from fascioliasis can be of great economic benefit to producers.

Aquaculture

Mechanism Determined of *Edwardsiella ictaluri* Disease in Catfish

Infection with *Edwardsiella ictaluri* is now the number one cause of bacterial disease in catfish aquaculture and results in annual losses estimated at over $3 million. Georgia scientists have successfully determined how the disease is produced and thus have enhanced the ability to control this disease. They have found that the disease may take two different forms. One is an acute disease with intestinal symptoms and heavy mortality. In the second form the bacteria cause a chronic infection of the nasal lining which may extend into the brain and cause death of the fish. The development of methods to recognize and study both forms of the disease is an essential step in determining how to treat and control this important disease of cultured catfish.

New Antimicrobial Agent to Treat Bacterial Diseases of Catfish

A new antimicrobical agent was made available for use in treatment of bacterial diseases of catfish through research efforts at the College of Veterinary Medicine, Mississippi State University. Efficacy, palatibility and residue studies have been completed under laboratory conditions. Field evaluations are being initiated. The potentiated sulfonamide, one of two antibacterial drugs available for catfish, has the advantages of being effective against a great majority of fish isolates and of being capable of being formulated into floating feed.

Table 2

Animal Health (Section 1433) Fund Allocations
FY 1979 to 1985

AES = Agricultural Experiment Station
SVM = Schools and Colleges of Veterinary Medicine
* = AES and SVM combined

	1979	1980	1981	1982	1983	1984	1985
ALABAMA							
AES, Auburn University	$85,549	$104,005	$108,063	$89,645	$88,463	$84,301	$86,828
SVM, Auburn University	$14,681	$27,320	$23,668	$21,560	$21,006	$22,391	$29,764
SVM, Tuskegee Institute	$30,054	$24,325	$26,886	$20,435	$21,103	$16,454	$10,998
ALASKA							
AES, University of Alaska	$8,016	$9,602	$11,589	$12,503	$15,053	$13,924	$9,318
ARIZONA							
AES, University of Arizona	$54,156	$66,874	$73,426	$60,007	$59,239	$54,686	$57,164
ARKANSAS							
AES, University of Arkansas	$68,868	$83,340	$91,359	$81,957	$81,621	$79,011	$78,085
CALIFORNIA							
AES, U. of California, Berkeley	$187,777	$218,204	$232,257	$203,790	$212,367	$226,345	$245,028
SVM, U. of California, Davis	$84,359	$85,821	$160,537	$177,166	$199,317	$188,341	$196,346
COLORADO							
AES, Colorado State University							
SVM, Colorado State University	*124,800	*232,980	*260,767	*276,285	*260,477	*262,454	*230,633
CONNECTICUT							
AES, Univ. of Connecticut, Storrs	$11,928	$16,840	$17,924	$20,041	$22,256	$24,065	$23,806
DELAWARE							
AES, University of Delaware	$11,148	$14,901	$16,814	$17,401	$16,776	$16,187	$14,380
FLORIDA							
AES, University of Florida	$76,232	$94,598	$98,792	$82,307	$81,509	$79,028	$82,885
SVM, University of Florida	$12,052	$14,011	$15,811	$15,821	$23,915	$34,538	$49,013

GEORGIA							
AES, University of Georgia	$43,330	$46,979	$49,398	$40,281	$37,903	$33,989	$29,647
SVM, University of Georgia	$111,302	$130,171	$137,082	$124,516	$130,479	$136,986	$143,203
HAWAII							
AES, University of Hawaii	$7,752	$8,481	$9,156	$8,341	$8,458	$8,314	$7,943
IDAHO							
AES, University of Idaho	$58,175	$73,323				$71,230	$64,687
SVM, University of Idaho	$23,845	$27,517	*104,670	*85,447	*82,667	$13,487	$15,638
ILLINOIS							
AES, University of Illinois	$56,076						
SVM, University of Illinois	$124,620	*200,909	*200,150	*167,905	*164,312	*171,958	*179,934
INDIANA							
AES, University of Indiana	$8,381						
SVM, University of Indiana	$104,695	*131,077	*141,379	*120,908	*123,647	*123,794	*123,252
IOWA							
AES, Iowa State University	$30,634	$35,405	$42,338	$51,691	$64,009	$70,018	$67,881
SVM, Iowa State University	$250,322	$311,942	$326,415	$280,350	$261,622	$254,464	$285,524
KANSAS							
AES, Kansas State University							
SVM, Kansas State University	*157,716	*194,993	*206,457	*185,103	*186,541	*190,193	*184,651
KENTUCKY							
AES, University of Kentucky	$91,668	$107,071	$109,265	$93,303	$98,340	$98,166	$98,092
LOUISIANA							
AES, Louisiana State University	$87,973	$101,978	$110,564	$94,090	$89,607	$84,321	$80,562
SVM, Louisiana State University	$4,127	$11,486	$15,512	$17,501	$25,013	$30,105	$30,042
MAINE							
AES, University of Maine	$17,316	$23,455	$25,046	$24,622	$22,675	$2,012	$18,102
MARYLAND							
AES, University of Maryland	$56,469	$64,442	$68,862	$54,976	$57,058	$50,065	$48,548
John Hopkins University	$14,499	$15,787	$15,584	$10,449	$0	$0	$0

MASSACHUSETTS							
AES, Univ. of Massachusetts	$19,440	$23,705	$21,738	$16,945	$15,670	$12,126	$10,620
SVM, Tufts University	$0	$0	$28,052	$36,068	$36,849	$56,192	$51,016
MICHIGAN							
AES, Michigan State University			$91,319	$68,783			
SVM, Michigan State University	*138,120	*148,301	$51,366	$47,294	*110,149	*107,814	*103,969
MINNESOTA							
AES, University of Minnesota	$44,062	$81,970	$84,055	$76,364	$70,268	$74,718	$82,115
SVM, University of Minnesota	$123,770	$125,357	$144,017	$124,668	$132,156	$123,487	$111,182
MISSISSIPPI							
AES, Mississippi State Univ.							
SVM, Mississippi State Univ.	*56,712	*75,867	*81,045	*76,879	*69,523	*62,566	*52,007
MISSOURI							
AES, University of Missouri		$75,175	$66,293	$45,869	$42,073	$61,934	$73,452
SVM, University of Missouri	*130,920	$87,841	$121,398	$123,728	$121,225	$93,589	$67,853
MONTANA							
AES, Montana State University	$91,956	$106,421	$111,624	$89,650	$83,889	$77,041	$77,156
NEBRASKA							
AES, University of Nebraska	$147,648	$180,942	$203,947	$184,801	$190,134	$191,682	$193,987
NEVADA							
AES, University of Nevada	$28,620	$30,751	$30,547	$23,947	$21,672	$18,647	$17,365
NEW HAMPSHIRE							
AES, Univ. of New Hampshire	$16,512	$16,872	$16,206	$12,753	$12,482	$11,678	$11,190
NEW JERSEY							
AES, Rutgers University	$26,004	$31,407	$32,008	$27,466	$28,707	$26,715	$26,978
NEW MEXICO							
AES, New Mexico State Univ.	$39,624	$49,104	$50,407	$43,831	$39,689	$38,421	$41,159
NEW YORK							
AES, Cornell University	$24,734	$24,621	$38,475	$43,554	$51,701	$50,473	$51,250
SVM, Cornell University	$181,522	$203,053	$223,216	$188,889	$199,730	$206,594	$221,233

NORTH CAROLINA	$117,576						
AES, North Carolina State Univ.	$0	*125,158	*126,026	*101,339	*97,640	*97,193	*100,061
NORTH DAKOTA							
AES, North Dakota State Univ.	$58,764	$67,213	$69,565	$57,879	$56,734	$57,644	$58,502
OHIO							
Agr. R&D Center, Ohio State U.	$86,789	$98,576	$89,550	$65,621	$61,952	$64,874	$70,716
SVM, Ohio State University	$56,227	$51,921	$60,966	$69,974	$70,324	$70,147	$53,379
OKLAHOMA							
AES, Oklahoma State Univ.	$130,158	$148,637	$157,722				
SVM, Oklahoma State Univ.	$4,002	$6,145	$5,066	*130,813	*129,962	*123,764	*125,298
OREGON							
AES, Oregon State University	$44,287	$58,795	$66,998	$63,963	$68,444	$62,117	$53,015
SVM, Oregon State University	$47,045	$54,244	$59,314	$50,978	$40,850	$37,633	$42,804
PENNSYLVANIA							
AES, Univ. of Pennsylvania	$60,428	$67,793	$64,985	$55,225	$52,832	$52,447	$52,337
SVM, Univ. of Pennsylvania	$62,399	$74,501	$97,406	$105,426	$117,555	$119,287	$108,886
Lehigh University	$2,549	$2,791	$0	$0	$0	$0	$0
PUERTO RICO							
AES, University of Puerto Rico	$7,164	$19,280	$16,935	$16,008	$16,418	$15,292	$14,543
RHODE ISLAND							
AES, Univ. of Rhode Island	$12,684	$12,199	$15,231	$12,658	$13,549	$14,402	$14,910
SOUTH CAROLINA							
AES, Clemson University	$28,704	$28,671	$28,397	$23,241	$23,012	$23,754	$23,555
SOUTH DAKOTA							
AES, South Dakota State Univ.	$101,676	$118,702	$125,871	$109,615	$105,878	$101,127	$96,112
TENNESSEE							
AES, University of Tennessee							
SVM, University of Tennessee	*64,812	*73,301	*82,137	*73,990	*76,904	*74,629	*70,441
TEXAS							
AES, Texas A&M University							
SVM, Texas A&M University	*362,604	*425,692	*436,027	*343,157	*319,658	*331,193	*346,564

UTAH							
AES, Utah State Univesity	$34,476	$52,768	$60,889	$61,031	$61,301	$60,935	$57,344
VERMONT							
AES, University of Vermont	$16,752	$19,305	$19,674	$17,148	$18,253	$18,977	$18,298
VIRGINIA							
AES, VPI & SU							
SVM, VPI & SU	*70,956	*85,377	*95,619	$86,636	$90,487	$84,512	$90,624
WASHINGTON							
AES, Washington State University	$35,975	$37,457	$35,524	$28,038	$27,741	$30,950	$34,631
SVM, Washington State University	$71,557	$94,349	$115,483	$110,128	$115,258	$111,666	$116,010
WEST VIRGINIA							
AES, West Virginia University	$17,652	$21,579	$23,531	$18,317	$17,463	$16,035	$16,267
WISCONSIN							
AES, University of Wisconsin	$176,148	$225,816	$239,723	$215,841			
SVM, University of Wisconsin	$0	$0	$0	$0	*212,814	*213,497	*208,846
WYOMING							
AES, University of Wyoming	$43,812	$50,106	$51,986	$43,044	$42,162	$42,203	$43,265
TOTAL	$4,800,000	$5,760,000	$6,240,000	$5,529,600	$5,518,541	$5,496,422	$5,474,304

Table 3
SECTION 1433 ALLOCATIONS
FY 1979-1985

Percent of Total Section 1433 Funds Allocated to Specific Eligible Institutions

State and Institution	Fiscal Year 79	80	81	82	83	84	85
				Percent			
ALABAMA							
SAES	1.782	1.806	1.732	1.621	1.603	1.534	1.586
Auburn Sch. Vet. Med.	0.306	0.474	0.379	0.390	0.381	0.417	0.544
Tuskegee Sch. Vet. Med.	0.626	0.422	0.431	0.370	0.382	0.299	0.201
ALASKA							
SAES	0.167	0.167	0.186	0.226	0.273	0.253	0.170
ARIZONA							
SAES	1.128	1.161	1.177	1.085	1.073	0.994	1.044
ARKANSAS							
SAES	1.435	1.447	1.464	1.482	1.479	1.437	1.426
CALIFORNIA							
SAES	3.912	3.788	3.722	3.685	3.848	4.118	4.476
School of Vet. Med.	1.757	1.490	2.573	3.204	3.612	3.427	3.587
COLORADO							
SAES and Col. Vet. Med.	2.600	4.045	4.179	4.996	4.720	4.775	4.213
CONNECTICUT							
SAES	0.249	0.292	0.287	0.362	0.403	0.438	0.435
DELAWARE							
SAES	0.232	0.259	0.269	0.308	0.304	0.295	0.271
FLORIDA							
SAES	1.588	1.642	1.583	1.488	1.477	1.438	1.514
College of Vet. Med.	0.251	0.243	0.253	0.286	0.433	0.628	0.895

GEORGIA							
SAES	0.903	0.816	0.792	0.728	0.687	0.618	0.542
College of Vet. Med.	2.319	2.260	2.197	2.252	2.364	2.492	2.616
HAWAII							
SAES	0.162	0.147	0.147	0.151	0.153	0.151	0.145
IDAHO							
SAES	1.212	1.273	1.678	1.545	1.498	1.296	1.182
College of Vet. Med.	0.162	0.478	*	*	*	0.245	0.286
ILLINOIS							
SAES and Col. Vet. Med.	3.765	3.488	3.208	3.036	2.977	3.129	3.287
INDIANA							
SAES and Sch. Vet. Med.	2.356	2.276	2.266	2.187	2.241	2.252	2.251
IOWA							
SAES	0.638	0.615	0.678	0.935	1.160	1.274	1.240
College of Vet. Med.	5.215	5.416	5.231	5.070	4.741	4.630	4.722
KANSAS							
SAES and Col. Vet. Med.	3.286	3.385	3.309	3.347	3.380	3.460	3.373
KENTUCKY							
SAES	1.910	1.859	1.751	1.687	1.782	1.786	1.792
LOUISIANA							
SAES	1.833	1.770	1.772	1.702	1.624	1.534	1.472
College of Vet. Med.	0.086	0.199	0.249	0.316	0.453	0.548	0.549
MAINE							
SAES	0.361	0.407	0.401	0.445	0.411	0.364	0.331
MARYLAND							
SAES	1.176	1.119	1.104	1.141	1.034	0.912	0.887
Johns Hopkins Univ.	0.302	0.274	0.250	0.042	0	0	0
MASSACHUSETTS							
SAES	0.405	0.412	0.348	0.306	0.284	0.221	0.194
Tufts University	0	0	0	0.652	0.668	1.022	0.932

MICHIGAN							
SAES	2.878	2.575	1.463	1.244	2.000	1.962	1.899
College of Vet. Med.	*	*	0.823	0.855	*	*	*
MINNESOTA							
SAES	0.918	1.423	1.347	1.381	1.273	1.359	1.500
College of Vet. Med.	2.579	2.176	2.308	2.255	2.395	2.247	2.031
MISSISSIPPI							
SAES and Col. Vet. Med.	1.182	1.317	1.299	1.390	1.260	1.138	0.950
MISSOURI							
SAES	2.728	1.305	1.062	0.830	0.762	1.127	1.342
College of Vet. Med.	*	1.525	1.945	2.238	2.197	1.703	1.239
MONTANA							
SAES	1.916	1.848	1.789	1.621	1.520	1.402	1.409
NEBRASKA							
SAES	3.076	3.141	3.268	3.342	3.445	3.487	3.544
NEVADA							
SAES	0.596	0.534	0.490	0.433	0.393	0.339	0.317
NEW HAMPSHIRE							
SAES	0.344	0.293	0.260	0.231	0.226	0.212	0.204
NEW JERSEY							
SAES	0.542	0.545	0.513	0.497	0.520	0.486	0.493
NEW MEXICO							
SAES	0.818	0.853	0.808	0.793	0.719	0.699	0.752
NEW YORK							
SAES	0.515	0.427	0.617	0.788	0.937	0.918	0.936
College of Vet. Med.	3.782	3.525	3.577	3.416	3.619	3.759	4.041
NORTH CAROLINA							
SAES and Sch. Vet. Med.	2.450	2.173	2.020	1.833	1.769	1.750	1.828
NORTH DAKOTA							
SAES	1.224	1.167	1.115	1.047	1.028	1.049	1.069

OHIO							
SAES	1.808	1.711	1.435	1.187	1.123	1.180	1.292
College of Vet. Med.	1.171	0.901	0.977	1.265	1.274	1.276	0.975
OKLAHOMA							
SAES and Col. Vet. Med.	2.795	2.687	2.609	2.366	2.355	2.252	2.289
OREGON							
SAES	0.923	1.021	1.074	1.157	1.240	1.130	0.968
School of Vet. Med.	0.980	0.949	0.949	0.923	0.740	0.685	0.782
PENNSYLVANIA							
SAES	1.258	1.177	1.041	0.999	0.957	0.954	0.956
Lehigh University	0.053	0.048	0	0	0	0	0
School of Vet. Med.	1.300	1.293	1.561	1.907	2.130	2.172	1.989
PUERTO RICO							
SAES	0.149	0.335	0.271	0.289	0.298	0.278	0.266
RHODE ISLAND							
SAES	0.264	0.212	0.244	0.229	0.246	0.262	0.272
SOUTH CAROLINA							
SAES	0.536	0.498	0.455	0.420	0.417	0.432	0.430
SOUTH DAKOTA							
SAES	2.118	2.061	2.017	1.982	1.919	1.840	1.756
TENNESSEE							
SAES and Col. Vet. Med.	1.350	1.273	1.316	1.338	1.394	1.358	1.287
TEXAS							
SAES and Col. Vet. Med.	7.554	7.390	6.988	6.206	5.792	6.026	6.331
UTAH							
SAES	0.718	0.916	0.976	1.104	1.111	1.109	1.048
VERMONT							
SAES	0.349	0.335	0.315	0.310	0.331	0.345	0.334
VIRGINIA							
SAES and Col. Vet. Med.	1.478	1.482	1.532	1.567	1.640	1.538	1.655

WASHINGTON							
SAES	0.750	0.650	0.569	0.507	0.503	0.563	0.632
College of Vet. Med.	1.491	1.638	1.851	1.992	2.089	2.032	2.119
WEST VIRGINIA							
SAES	0.368	0.375	0.377	0.331	0.316	0.292	0.297
WISCONSIN							
SAES and Sch. Vet. Med.	3.670	3.920	3.842	3.903	3.856	3.884	3.815
WYOMING							
SAES	0.913	0.870	0.833	0.778	0.764	0.768	0.790

* Combined with SAES

Table 4

ANIMAL HEALTH SPECIAL RESEARCH GRANT AWARDS
Fiscal Years 1979-1985

Commodity and Disease	1979-1982		1983		1984		1985		Total	
	Projects	Funds	Projects	Funds	Projects	Funds	Projects	Funds	Projects	Funds
BEEF CATTLE										
Respiratory Diseases	30	$3,721,955	12	$1,157,348	8	$1,151,693	6	$961,759	56	$6,992,755
Reproductive Diseases (including Anestrus)	13	$1,609,994	7	$900,753	6	$760,770	5	$599,505	31	$3,871,022
Enteric Diseases	20	$1,957,458	4	$368,889	6	$575,847	4	$473,954	34	$3,376,148
Metabolic Diseases	5	$436,350	0	---	0	---	0	---	5	$436,350
Toxicosis	4	$356,162	1	$100,000	0	---	0	---	5	$456,162
Bluetongue	4	$506,207	0	---	1	$103,000	1	$139,303	6	$748,510
Internal Parasites	14	$1,575,555	2	$258,826	3	$287,923	2	$147,366	21	$2,269,670
External Parasites	8	$801,717	2	$139,600	1	$51,634	1	$100,000	12	$1,092,951
Other Diseases	2	$100,920	0	---	0	---	0	---	2	$100,920
Subtotal	100	$11,066,318	28	$2,925,416	25	$2,930,867	19	$2,421,887	172	$19,344,488
DAIRY CATTLE										
Mastitis	19	$1,689,470	8	$442,663	5	$441,200	4	$368,439	36	$2,941,772
Respiratory Diseases	6	$490,945	2	$188,653	2	$189,085	2	$157,902	12	$1,026,585
Reproductive Diseases (including Anestrus)	16	$1,699,120	2	$213,772	4	$378,171	2	$298,316	24	$2,589,388
Enteric Diseases	6	$340,138	2	$203,544	1	$126,057	2	$210,536	11	$880,275
Metabolic Diseases	6	$502,805	0	---	0	---	0	---	6	$502,805
Bluetongue	0	---	1	$132,414	0	---	0	---	1	$132,414
Internal Parasites	2	$73,245	0	---	0	---	0	---	2	$73,245
External Parasites	1	$58,500	0	---	0	---	0	---	1	$58,500
Other Diseases	2	$259,837	1	$50,000	0	$744,423	0	---	4	$384,260
Subtotal	58	$5,114,069	16	$1,231,046	13	$1,208,936	10	$1,035,193	97	$8,589,244

SWINE										
Enteric Diseases	21	$1,697,670	5	$317,969	3	$316,350	3	$221,456	32	$2,553,445
Respiratory Diseases	7	$645,529	3	$317,969	3	$316,350	2	$225,455	15	$1,505,303
Reproductive Diseases	3	$378,062	2	$163,194	3	$248,735	1	$131,389	9	$921,380
Pseudorabies	3	$459,676	2	$208,498	0	---	2	$267,071	7	$935,245
MMA	5	$374,779	2	$154,083	1	$98,851	0	---	8	$627,713
Internal Parasites	5	$459,663	1	$30,000	0	---	2	$153,337	8	$643,000
External Parasites	2	$187,980	0	---	0	---	0	---	2	$187,980
Toxicosis	2	$190,064	1	$78,779	4	$285,114	1	$58,006	8	$611,963
Skeletal Diseases (Lameness)	4	$320,386	0	---	0	---	0	---	4	$320,386
Subtotal	52	$4,713,809	16	$1,270,492	14	$1,265,400	11	$1,056,714	93	$8,306,415
POULTRY										
Respiratory Diseases	26	$1,739,173	6	$454,450	4	$352,358	4	$356,656	40	$2,902,637
Skeletal Diseases	4	$427,190	1	$146,159	0	---	0	---	5	$573,349
Enteric Diseases	5	$328,380	3	$257,008	1	$90,741	1	$74,230	10	$750,359
Neoplastic Diseases (Incl. Marek's Disease)	5	$264,636	0	---	1	$144,666	0	---	6	$409,302
Internal Parasites	3	$337,350	0	---	0	---	1	$68,432	4	$406,282
Toxicosis	4	$355,428	0	---	0	---	0	---	4	$355,428
Other Diseases	1	$113,410	0	---	2	$266,414	2	$213,993	5	$593,817
Subtotal	48	$3,566,067	10	$857,617	8	$854,179	8	$713,311	74	$5,991,174
SHEEP and GOATS										
Respiratory Diseases	2	$209,281	0	---	1	$77,145	0	---	3	$286,426
Predator Control	6	$382,404	0	---	0	---	0	---	6	$382,404
Reproductive Diseases	2	$75,078	1	$54,842	1	$121,000	0	---	4	$250,920
Bluetongue	1	$60,000	1	$100,000	1	$122,000	1	$120,316	4	$402,316
Caseous Lymphadenitis	3	$244,337	0	---	0	---	1	$147,031	4	$391,368
Contageous Ecthyma	1	$147,063	0	---	0	---	0	---	1	$147,063
Internal Parasites	5	$433,465	1	$46,591	0	---	0	---	6	$480,056
Other Diseases	3	$72,368	1	$120,000	0	---	0	---	4	$192,368
Subtotal	23	$1,623,996	4	$321,433	3	$320,145	2	$267,347	32	$2,532,921

HORSES										
Respiratory Diseases	6	$473,096	2	$103,390	1	$64,999	1	$105,000	10	$746,485
Enteric Diseases	1	$47,587	1	$110,668	0	---	1	$73,040	3	$231,295
Musculoskeletal Disease	3	$317,799	0	---	1	$148,201	0	---	4	$466,000
Internal Parasites	2	$229,270	0	---	0	---	0	---	2	$229,270
Subtotal	12	$1,067,752	3	$214,058	2	$213,200	2	$178,040	19	$1,673,050
AQUACULTURE										
Infectious Diseases	7	$667,552	2	$107,375	2	$106,945	2	$89,308	13	$971,180
Parasites	2	$170,777	0	---	0	---	0	---	2	$170,777
Subtotal	9	$838,329	2	$107,375	2	$106,945	2	$89,308	15	$1,141,957
TOTAL	302	$27,990,340	79	$6,927,437	67	$6,899,672	54	$5,761,800	502	$47,579,249

Table 5
ANIMAL HEALTH SPECIAL RESEARCH GRANTS
FISCAL YEAR 1985

Area	Number of Proposals	Proposals Funded	Success Rate	Amount Requested	Amount Granted	
BEEF and DAIRY CATTLE						
Reproductive Diseases	73	8	11%	$9,748,366	$1,037,124	Beef - $738,808 Dairy - $298,316
Respiratory Diseases	54	8	15%	$7,239,358	$1,119,661	Beef - $961,759 Dairy - $157,902
Mastitis	37	4	11%	$4,230,296	$368,339	Dairy $368,439
Enteric and Digestive Diseases	32	3	16%	$4,498,563	$540,636	Beef - $473,954 Dairy - $66,682
Parasitic and Metabolic Diseases	35	5	9%	$4,000,887	$247,366	Beef - $247,366 Dairy - $143,854
Johne's Disease	10	1	10%	$1,273,179	$143,854	Dairy - $143,854
SWINE						
Enteric diseases	17	3	18%	$2,022,463	$221,456	
Respiratory Diseases	22	3	14%	$2,929,622	$373,876	
Reproductive Diseases	14	2	14%	$1,610,632	$250,039	
Other Swine	12	3	25%	$1,301,349	$211,343	
POULTRY						
Respiratory Diseases	28	4	14%	$3,249,669	$356,656	
Metabolic and Immunologic Diseases	27	2	7%	$3,579,089	$213,993	
Enteric Disorders	13	2	15%	$1,425,789	$142,662	
SHEEP and GOATS	31	2	6%	$3,484,089	$267,347	
HORSES	34	2	6%	$3,225,505	$178,040	
AQUACULTURE	7	*2	29%	$538,598	$89,308	
TOTAL	446	54	12%	$54,357,758	$5,761,800	

*One proposal partially funded by Animal Health and Aquaculture funds

Table 6

ANIMAL HEALTH SPECIAL RESEARCH GRANTS
FISCAL YEAR 1986 PRIORITIES

		Percent of Commodity
3.1	Beef Cattle — 41.73 percent of Funds	
	(1) Respiratory disease complex. (16.69 percent of available funds)	40
	(2) Reproductive diseases, especially brucellosis and including but not limited to anestrus, leptospirosis and vibrosis. (12.52 percent of available funds)	30
	(3) Enteric diseases. (8.35 percent of available funds)	20
	(4) Parasites (internal & external) including but not limited to anaplasmosis, ticks, flukes, nematodes and interactive effects of internal and external parasites. Metabolic diseases, especially bloat, grass tetany and mineral imbalances. (4.17 percent of available funds)	10
3.2	Dairy Cattle — 18.27 percent of Funds	
	(1) Mastitis. (Approximately 6.40 percent of available funds)	35
	(2) Reproductive diseases, including but not limited to brucellosis and non-detected estrus. (5.48 percent of available funds)	30
	(3) Respiratory diseases. (2.74 percent of available funds)	15
	(4) Digestive and enteric diseases, including but not limited to Johne's Disease. (1.83 percent of available funds)	10
	(5) Johne's Disease. (1.82 percent of available funds)	10
3.3	Swine — 18.34 percent of Funds	
	(1) Enteric diseases. Viral enteritis, coccidiosis, salmonellosis, clostridium, colibacillosis, dysentery, and proliferative enteritis. (4.59 percent of available funds)	

		Percent of Commodity
(2)	Respiratory diseases. Hemophilus pleuropneumonia, mycoplasma pneumonia, atrophic rhinitis, pasteurella multocida, influenza, and haemophilus parasuis. (4.59 of available funds)	30
(3)	Reproductive diseases. Parvovirus, MMA, leptospirosis, and streptococcus. (4.58 percent of available funds)	25
(4)	Others. Trichinosis, mycotoxicosis, pseudorabies, lameness, eperythrozoonosis, and parasites. (4.58 of available funds)	20

3.4 Poultry — 12.38 Percent of Funds

(1)	Respiratory diseases. (4.34 percent of available funds)	40
(2)	Metabolic and immunologic diseases. (4.33 percent of available funds)	40
(3)	Enteric disorders. (3.71 percent of available funds)	20

3.5 Sheep and Goats

Bluetongue, foot rot, chlamydial polyarthritis, respiratory diseases, and mastitis.
(4.64 of available funds)

3.6 Horses

Especially respiratory diseases, and including but not limited to enteric diseases, reproductive diseases, and musculoskeletal diseases (especially laminitis and lameness).
(3.09 percent of available funds)

3.7 Aquaculture

Infectious diseases and parasites.
(1.55 percent of available funds)

Table 7

Summary of Animal Health and Disease Research Priorities
D. K. Sorensen, AVMA Council on Research

Organizations representing all of the commodities have developed animal disease research priorities. Following is a summary of priorities for each commodity as determined by selected organizations.

Beef Cattle

National Cattlemen Association (1983)

1. Respiratory Disease Complex — interrelationship between infectious agents and managements
2. Brucellosis — improved vaccines, improved methods of diagnosis and procedure
3. Enteritis Complex — improved methods of diagnosis and prevention
4. Leptospirosis — identification of pathogenic strains
5. Anaplasmosis — transmission studies and improved methods for prevention
6. Weak calf syndrome — cause, methods of diagnosis and prevention
7. Vesicular stomatitis — vectors and mode of transmission studies
8. Foot rot — Cause and methods of prevention
9. Bluetongue — accurate diagnostic tests

North Central Advisory Committee (NCA-2) (1984)

1. Respiratory Diseases
2. Enteric diseases
3. Reproductive diseases
4. Infectious keratoconjunctivitis (pinkeye)
5. Infectious pododermatitis (foot rot)
6. Parasitic diseases
7. Environmental and toxic diseases
8. Encephalitic diseases
9. Clostridial diseases

Dairy Cattle

National Dairy Herd Improvement Association (1984)

1. Mastitis
2. Reproductive Diseases

North Central Advisory Committee (NCA-2) (1984)

1. Reproductive Diseases
2. Enteric and Johne's Disease
3. Mastitis

4. Digestive and metabolic diseases associated with high

production and high energy rations
5. Musculo-skeletal diseases; arthritis and foot rot
6. Respiratory diseases including calf pneumonia
7. Leucosis

Swine

National Pork Producers Council

1. Respiratory Diseases

Hemophilus pleuropneumonia
Mycoplasma pneumonia
Atrophic rhinitis
Pasteurella multocida
Swine influenza
Pseudorabies
Hemophilus parasuis

2. Enteric Diseases

E. Coli diarrhea (low research priority)
Coccidiosis
Clostridial infections
TGE
Other viral infections
Thread worm
Salmonella
Swine dysentery
Internal parasites (low research priority)
Proliferative ileitis

3. Reproductive Diseases

MMA
Porcine parvovirus
Leptospirosis (low research priority)
Eperythrozoonosis
Streptococcal infections
Pseudorabies (low research priorities)

4. Other

External parasites
Lameness
Economics (cost effectiveness)

North Central Advisory Committee (NCA-2) 1984

1. Enteric diseases
2. Respiratory diseases
3. Pseudorabies
4. Perinatal Mortality
5. Effects of environmental factors
6. Arthritis

7. Swine abscesses
8. Toxic diseases
9. Control measures for internal and external parasites

Poultry - Broilers

National Broiler Federation (1984-85)

1. Respiratory Diseases
2. Improved diagnostic procedures for all diseases
3. Hemorrhagic syndrome

Poultry and Egg Institute of America (1983-84)

1. Immunology — basic research to improve efficacy of vaccination
2. Leg problems
3. Mycotoxin -- development of more rapid and accurate tests for identification and quantification of mycotoxins in tissues and feeds

North Central Advisory Committee (NCA-2) (1984)

1. Respiratory Diseases
2. Immunologic Disorders
3. Enteric Diseases
4. Leg Disorders
5. Bacterial septicemias
6. Reproductive Diseases
7. Transmissible tumors

Poultry — Turkeys

National Turkey Federation (1984)

1. Respiratory Infections
   Colibacillosis
   Aspergillosis
   Avian influenza
   Paramyxovirus infections

2. Enteric Disorders
   Viral enteritis

3. Other Respiratory Infections
   Turkey coryza syndrome
   Mycoplasmosis
   Chlamydiosis

4. Other Enteric Disorders
   Salmonellosis - Arizonosis
   Hemorrhagic enteritis
   Coccidiosis
   Mycosis
   Mycotoxicosis

5. Skeletal Problems
   Osteomyelitis
   Tibial dyschondroplasia
   Nutritional and non-infectious musculo-skeletal problems
   Mycoplasmosis
   Tibial rotatation
   Vertebral fractures

6. Immune Diseases
   Infectious bursal disease
   Mycotoxicosis

7. Systemic Infections
   Erysipelas
   Transmissible neoplasms
   Turkey virus hepatitis

8. Miscellaneous
   Roundheart
   Aneurysm
   Leg edema
   Muscle dystrophy
   Interaction between genetics and environment on disease resistance
   Drugs/chemical residues
   Reproductive diseases
   Encephalomalacia

9. Parasitic Problems
   External parasites
   Internal parasites

Sheep

American Sheep Industry (1983)

1. Bluetongue disease -- diagnosis and control
2. Foot rot " "
3. Pulmonary/resp. diseases " "
4. Polyarthritis " "
5. Maintain the IR-4 program for registering drugs for use in minor species

National Wool Growers Assocation, Inc. (1985)

1. Foot Rot
2. Bluetongue

National Central Advisory (NCA-2) Committee (1984)

1. Respiratory diseases
2. Internal parasites
3. Enteric diseases
4. Reproductives diseases
5. Environmental, metabolic and toxic diseases

6. Foot rot

Goats

North Central Advisory Committee (NCA-2) (1984)

1. Reproductive diseases
2. Mastitis
3. Enteric diseases
4. Caprine arthritic encephalitis
5. Foot rot
6. Caseous lymphadenitis

Horses

North Central Advisory Committee (NCA-2) (1984)

1. Respiratory diseases
2. Musculoskeletal diseases
3. Reproductive diseases
4. Digestive diseases
5. Internal parasites

☆U.S. GOVERNMENT PRINTING OFFICE: 1986–624-808/822